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BOTANY.—*The American species of Maximilianea (Cochlospermum).* S. F. BLAKE, Bureau of Plant Industry.[1]

The principal genus of the small family Cochlospermaceae is that which has generally been known under the name *Cochlospermum*, given it by Kunth in 1822. Three years previously Schrank had published for another species of the same genus Martius' manuscript name *Maximilianea*, and it is this name which must be employed for the genus under the American Rules. Martius' single species was named *Maximilianea regia* in honor of King Maximilian of Bavaria. Unfortunately, Martius was not satisfied with this dedication and employed[2] the same name (in the spelling *Maximiliana*) a few years later for a species representing a new genus of palms, for which it has generally been adopted. Simultaneously he proposed the name *Wittelsbachia* for the genus which he had earlier called *Maximilianea*, Kunth's name *Cochlospermum* being rejected because of the prior *Cochliospermum* of Lagasca.

In 1847 Planchon published a revision of the family Cochlospermeae. He[3] divided the genus *Cochlospermum* into two subgenera: *Eucochlospermum*, including as American species *Cochlospermum insigne* and *C. hibiscoides;* and *Diporandra*, containing three species, all American, two of which were described as new. The first subgenus was characterized by its strongly imbricated sepals, free filaments, anthers opening by a single apical pore, reniform seeds, and palmatifid leaves; the second by its slightly imbricated sepals, irregularly subconnate filaments, two-pored anthers, twisted seeds (?), and digitate leaves. This classification was followed in Eichler's treatment in the *Flora Brasiliensis*.

[1] Received January 15, 1921.

[2] Hist. Nat. Palm. **2**: 131. 1824.

[3] Lond. Journ. Bot. **6**: 306–311. 1847.

In a collection recently made by Mr. Henri Pittier in Venezuela is a new species of this genus, which combines to some extent the characters relied upon by Planchon and Eichler for the separation of their subgenera. The leaves are digitately trifoliolate, but the anthers open by a single terminal pore and two tiny basal pores. Another species, described from Bolivia by H. Hallier, has digitate leaves and anthers opening by two apical pores and two smaller basal pores. Hallier raised the question whether these basal pores may not have been overlooked in other species of the subgenus *Diporandra*, but was prevented by lack of material from determining this point. There are in the National Herbarium no flowers of any of the previously described species of this subgenus, so that the question remains an open one, but it is probable, from the fact that two minute lateral basal pores are found in the anthers of *M. vitifolia*, of the group *Eucochlospermum*, that they occur in all the species.

The species of *Maximilianea* are shrubs or trees, with alternate palmatifid or digitate leaves and short panicles of handsome yellow flowers. The inner bark of two species (*M. regia* and *M. vitifolia*) is used in Brazil and Mexico for making ropes and cord, and the latter species (*M. vitifolia*) is sometimes grown as a hedge plant in the American tropics, but in general the genus is of little economic importance.

Maximilianea Mart.; Schrank, Flora **2**: 451. 1819.

Cochlospermum Kunth, Malv. 6, footnote.[4] 1822; H. B. K. Nov. Gen. & Sp. **5**: 297, footnote. 1822.
Wittelsbachia Mart. & Zucc. Nov. Gen. & Sp. **1**: 80. *pl. 55*. 1824.
"*Azeredia* Arruda; Allem. Appar. Coll. Desenh. Arruda, *cum tab.* 1846."
Type species *M. regia* Mart. & Schrank.

KEY TO SPECIES

Leaves palmate-lobed, the lobes serrate.
  Leaves 7-lobed, the lobes lanceolate, subcaudate-acuminate. 1. *M. codinae.*
  Leaves 3- to 7-lobed, the lobes obovate to oblong, acuminate to obtusish.
    Shrub 2 meters high; leaves 10 to 12 cm. wide; capsule glabrate, obtuse. 2. *M. regia.*
    Tree up to 8 meters high or more; leaves 10 to 33 cm. wide; capsule densely griseous-tomentellous, umbilicate. 3. *M. vitifolia.*
Leaves digitately 3- to 7-foliolate, the leaflets entire.
  Leaflets 3; anthers with a single terminal pore. 4. *M. triphylla.*
  Leaflets 5 to 7 (rarely 3); anthers with 2 terminal pores.
    Middle leaflet 10 to 18 cm. long.
      Middle leaflet 2 cm. wide; capsule glabrous, about 25 mm. long. 5. *M. tetrapora.*

[4] Genus named and one species (*Bombax gossypium* L.) cited, but no description or diagnosis.

Middle leaflet 3 to 6.5 cm. wide; capsule densely puberulous, 6 to 7.5 cm. long. 6. *M. orinocensis.*

Middle leaflet 5 to 7.5 cm. long.

Leaflets very obtuse, long-attenuate at base. 7. *M. parkeri.*

Leaflets abruptly acuminate, sessile. 8. *M. paviaefolia.*

1. **Maximilianea codinae** (Eichl.) Kuntze, Rev. Gen. Pl. **1**: 44, as *Maximiliana.* 1891.

Cochlospermum codinae Eichl. in Mart. Fl. Bras. **13**[1]: 431. *pl. 86, f.1.* 1871.

Leaves 7-lobed, the lobes lanceolate, subcaudate-acuminate, glaucescent beneath; two outer sepals oblong-ovate, subacute, the three inner rounded; petals three times as long; capsule obovate-oval in outline, obtusely 5-angled, 5-valved.

TYPE LOCALITY: Banks of the Río Pará, Brazil.

Described by Eichler from a drawing by Codina.

2. **Maximilianea regia** Mart. & Schrank, Flora **2**: 452. 1819.

Wittelsbachia insignis Mart. & Zucc. Nov. Gen. & Sp. **1**: 81. *pl. 55.* 1824.

Bombax hibiscifolium Willd.; Mart. & Zucc. Nov. Gen. & Sp. **1**: 81, as synonym.[5] 1824.

Cochlospermum insigne St. Hil. Pl. Us. Bras. *pl. 57.* 1827.

"*Azeredia pernambucana* Arruda; Allem. Appar. Coll. Desenh. Arruda, *cum tab.* 1846."

Cochlospermum insigne var. *pohliana* Eichl. in Mart. Fl. Bras. **13**[1]: 430. 1871.

Shrub about 2 meters high; branchlets pubescent at apex; petioles puberulous, 8 to 14 cm. long; leaves about 10 to 12 cm. wide, 3- or 5-lobed for three-fourths their length, the lobes oboval or ovate-oblong, acuminate to obtusish, pubescent beneath at maturity, the middle lobe 8 to 12 cm. long, 4 to 5 cm. wide; panicle pyramidate, the lower branches 2- to 4-flowered, the upper 1-flowered; pedicels 1.5 to 2.5 cm. long, tomentellous; flowers 6 to 8 cm. wide; two outer sepals ovate or oblong, subacute or obtuse, puberulous, the three inner 16 to 20 mm. long, 12 to 14 mm. broad, less pubescent; petals subquadrate-obovate, usually emarginate; stamens free, the anthers dehiscent by an apical pore; ovary with 3 to 5 placentae; capsule 3- to 5-valved, oblong-pyramidal, obtuse, 7 cm. long, glabrate; seeds reniform, 6 to 7 mm. wide, involved in dense whitish wool.

TYPE LOCALITY: Eastern Brazil.

RANGE: Provinces of Pernambuco, Goyaz, Bahia, and Minas Geraes, Brazil.

Not seen; the description compiled from those of Martius and Zuccarini and St. Hilaire, and from Eichler's[6] account in the *Flora Brasiliensis.* The capsule is said to have the odor of dill (*Anethum graveolens*). The filamentous bark, according to Eichler, is used for making rope. St. Hilaire states that a decoction of the roots is used for internal troubles, principally those resulting from falls or other accidents, and that this decoction is said to heal abscesses. He gives the native name as "butua do curvo."

[5] Wrongly referred to this species, according to Eichler.

[6] Fl. Bras. **13**[1]: 429–431. *pl. 86, f. 2.* 1871.

The typical form has the leaves somewhat pubescent beneath. The form described as var. *pohliana* by Eichler, with slightly larger and thicker always 3-lobed leaves, seems unworthy of recognition. Two other varieties, which appear sufficiently distinct for recognition by name, are the following:

Maximilianea regia glaberrima Chod. & Hassl. Bull. Herb. Boiss. II. **3:** 810. 1903.

Leaves strictly glabrous.

Described from *Hassler* 4934, from Nundurucay, and 4392, from the Río Capibary, Paraguay. Said to be a shrub 30 to 40 cm. high.

Maximilianea regia mattogrossensis (Pilger) Blake.

Cochlospermum insigne var. *mattogrossensis* Pilger, Bot. Jahrb. Engler **30:** 176. 1901.

Leaves densely and shortly cinereous-tomentose beneath.

Described from *Pilger* 518, from the upper Cuyabá Valley, Matto Grosso. Said to be a shrub with several unbranched stems from a thick rootstock.

3. **Maximilianea vitifolia** (Willd.) Krug & Urb. Bot. Jahrb. Engler **15:** 293, as *Maximiliania*. 1892.

Bombax vitifolium Willd. Enum. Hort. Berol. **2:** 720. 1809.
Cochlospermum serratifolium DC. Prodr. **1:** 527. 1824.
Bombax serratifolium [Moc. & Sessé;] DC. Prodr. **1:** 527, as synonym. 1824.
Mahuria ? speciosa Choisy in DC. Prodr. **1:** 558. 1824.
Wittelsbachia vitifolia Mart. & Zucc. Nov. Gen. & Sp. **1:** 82. 1824.
Cochlospermum hibiscoides Kunth, Syn. Pl. Aequin. **3:** 214. 1824.
Cochlospermum vitifolium Willd.; Spreng. Syst. **2:** 596, in part. 1825; Syst. **4:** Cur. Post. 206. 1827.
Maximiliana hibiscodes Kuntze, Rev. Gen. Pl. **1:** 44. 1891.

Large or small tree; branchlets at first loosely pilose; petioles more or less pubescent, glabrate, 8 to 28 cm. long; leaves usually 5-lobed, rarely 3- or 7-lobed, for one-half to three-fourths their length, 10 to 33 cm. wide, above more or less puberulous along the impressed veins, beneath loosely pilose along the veins and in youth along the chief veinlets, the lobes oblong to oval or obovate-oval, short-pointed or abruptly short-acuminate; inflorescence sordid-pubescent, the axis 3 to 9 cm. long, the spreading or ascending branches several-flowered toward the tip; pedicels densely puberulous or tomentulose, 2 to 3 cm. long; flowers 7.5 to 12.5 cm. wide; two outer sepals ovate to oblong-ovate, obtuse to rounded, sparsely or densely puberulous, 10 to 12 mm. long, the three inner broadly oval, rounded, finely and densely cinereous-puberulous, 16 to 22 mm. long; stamens free, the anthers opening by an apical pore and 2 minute basal pores; capsule broadly obovate-oval, 7 to 8 cm. long, about 6 cm. thick, densely griseous-tomentellous, 5-valved, umbilicate at apex; seeds involute-reniform, 4.5 mm. wide, involved in long whitish wool.

ILLUSTRATION: Hemsl. Biol. Centr. Amer. Bot. *pl. 2.*

TYPE LOCALITY: "Brazil" (*i. e.*, Campeche, *fide* Mart. & Zucc.).[7]

RANGE: Western Mexico, from Sinaloa and Guerrero to Chiapas and Yucatan, southward to Colombia (Santa Marta, *H. H. Smith* 830), and reported from Venezuela and Guayaquil;[8] also Cuba (introduced).

The species bears the following local names, many of which have been furnished me by Mr. Paul C. Standley: "rosa amarilla" (Sinaloa, where the

[7] MART. & ZUCC. Nov. Gen. & Sp. **1:** 82. 1824.

[8] H. B. K. Nov. Gen. & Sp. **7:** 223. 1825.

orange inner bark is used for making ropes); "palo amarillo," "palo de rosa amarilla" (Durango); "panaco" (Acapulco, Guerrero); "madera de pasta" (Veracruz, *Ramírez*); "apompo," "pongolote," "cojón de toro" (Oaxaca); "pochote" (Tabasco, Oaxaca); "cocito" (Chiapas); "tecomasúchil" (Chiapas, Guatemala); "quie-riga," "quie-quega," "huarumbo," "flor izquierda" (Chiapas and Oaxaca, *Seler*); "chuun," "chum," "chimu" (Maya, Yucatan); "tecomaxochitl" (Nahuatl); "tecomasuche" (Guatemala); "bombón," "catamericuche" (Nicaragua); "poró-poró" (Nicaragua, Panama, Costa Rica, Colombia); "flechero," "batabana," "bototo" (Venezuela, Colombia); "botija" (Cuba). Kunth[9] mentions the local names "botulo" (Guayaquil) and "carnestolendas" (Aragua, Venezuela). The branches root readily if thrust into the ground, and are frequently used to form hedges.

The original description of this species is so brief that it would not suffice to distinguish between *M. regia* and *M. vitifolia* as generally adopted. Willdenow gives the locality as Brazil, but Martius and Zuccarini, who examined the original in the Willdenow Herbarium, accredit it to Campeche, and their statement is here taken as authority for the use of the name in its generally accepted sense. *Mahuria ? speciosa*, which was based by Choisy on a single flower collected at Santa Marta by Bertero, is considered by St. Hilaire, who examined the original, as scarcely distinct from *M. regia*. It is clear, however, from the good specimen collected at the same locality by Herbert H. Smith, that the name belongs rather to *M. vitifolia*.

The ovary of *Cochlospermum hibiscoides* was wrongly described by Kunth as glabrous.

4. **Maximilianea triphylla** Blake, sp. nov.

Small tree; branchlets glabrous, lenticellate; petioles glabrous, 12.5 to 16 cm. long; leaflets 3, on petiolules 1 to 2 mm. long, the blades nearly membranaceous, the terminal one obovate-oval, 14.5 cm. long, 7.8 cm. wide, short-pointed with obtuse apex, broadly cuneate at base, glabrous, entire, marginate, light green, the chief nerves about six pairs, curved, ascending at an angle of about 60°, the secondary veins somewhat prominulous; lateral leaflets similar, oval, inequilateral, 12.5 cm. long, 6 cm. wide; flowering axis 6 cm. long, with about 5 short horizontal branches, sordid-puberulous toward the tip, each bearing toward apex about 4 flowers; pedicels obscurely puberulous, 2.8 cm. long; sepals 5, the two outer elliptic-oblong, rounded, sordid-pilose, dark colored, about 1.7 cm. long, 6 mm. wide, the three inner suborbicular, broadly rounded, densely canescent-pilosulous, 2 cm. long; petals 5, cuneate-obovate, apparently emarginate at apex, bright yellow, 5 cm. long, 2 to 2.5 cm. wide; stamens very numerous, with free glabrous filaments, the anthers yellow, linear, 4.8 to 6 mm. long, dehiscing by a single terminal pore and two minute basal pores; ovary densely tomentose, 5-celled; style glabrous, 3.5 cm. long.

Type in the U. S. National Herbarium, no. 1,065,095, collected in hedges at Valencia, Venezuela, April (flowers) and July (leaves), 1920, by H. Pittier (no. 8930).

[9] H. B. K. Nov. Gen. and Sp. 7: 223. 1825.

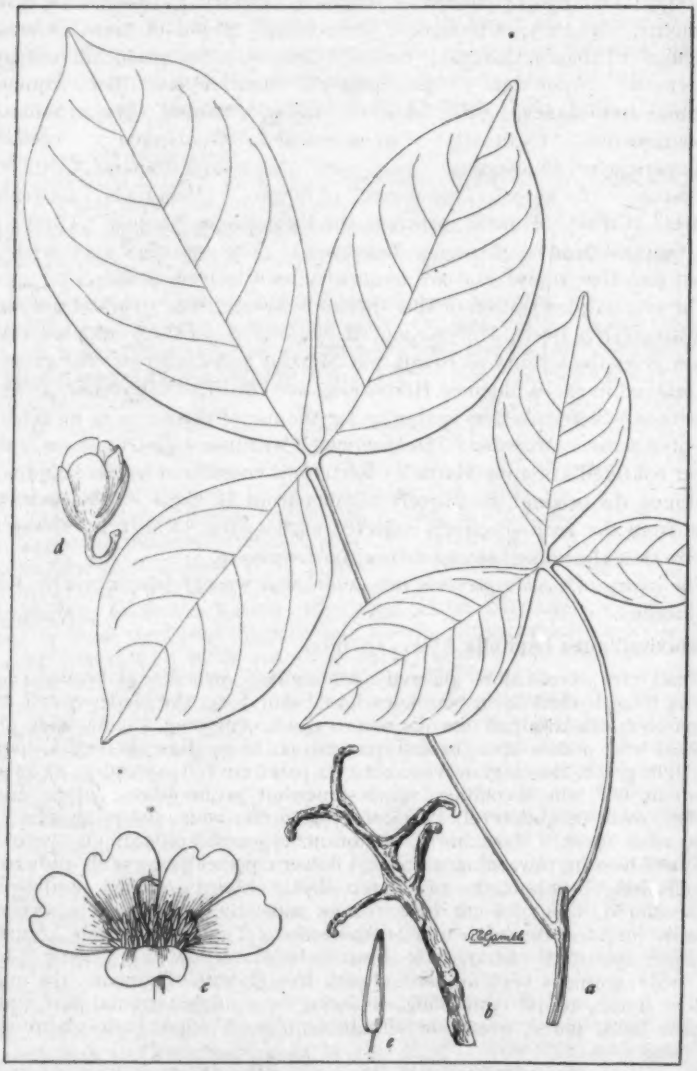

Fig. 1. *Maximilianea triphylla* Blake. *a*, leaves, × 1/2; *b*, inflorescence after defloration, × 1/2; *c*, flower, × 1/2; *d*, bud, × about 1/2; *e*, stamen, × 2 1/2.

This species is readily distinguished by its combination of digitate leaves and single apical anther pore. *M. tetrapora*, which is said by Hallier to have the leaves occasionally with three leaflets, is easily separated by its much smaller calyx, much narrower lanceolate leaflets, and anthers with two apical pores.

5. **Maximilianea tetrapora** (H. Hallier) Blake.

Cochlospermum tetraporum H. Hallier, Med. Rijks Herb. **19**: 39. 1913.

?Cochlospermum zahlbruckneri Ostermeyer, Rep. Sp. Nov. Fedde **13**: 395. 1914.

Leaves long-petioled, at first sparsely pilose, the leaflets 5 to 7, rarely 3, very shortly petiolulate, the blades lanceolate, membranaceous, with a very narrow acumen at apex, attenuate at base, the two basal ones inequilateral, the middle leaflet 10.5 cm. long, 2 cm. wide; peduncles dichotomous, glabrous; pedicels 2.5 cm. long, glabrous; sepals ovate or elliptic, 10 to 12 mm. long, 5 to 8 mm. wide, the inner densely puberulous and ciliolate; petals obovate, excised, 4 cm. long, 2.5 cm. wide; anthers 3 to 4 mm. long, dehiscing by two apical and two smaller basal pores; capsule fusiform-subglobose, glabrous, 2.3 cm. long, 1.8 cm. wide.

TYPE LOCALITY: Caipipendi Valley, Bolivia.

Not seen; described by Hallier from *Herzog* 1101, collected on dry hills on the left bank of the Pilcomayo at Ibiboba, Bolivia, at an altitude of 400 meters, in November, 1910, and *Herzog* 1242, from the Caipipendi Valley, altitude 1000 meters, December, 1910. As the material of the former number consisted only of three flowers, the latter should be selected as the type.

The short description by Ostermeyer of his *Cochlospermum zahlbruckneri* agrees very well with the full description given by Hallier of *C. tetraporum*, and there can be little question that the two are the same. The former was based on material collected by J. Schuel in 1913 in the Province of Jujuy, Argentina, a region very close to the type locality of *M. tetrapora*. Ostermeyer gives the local name of his species as "palo papel." The reddish brown papery exfoliating bark of *M. tetrapora* is likewise mentioned by Hallier.

6. **Maximilianea orinocensis** (H. B. K.) Kuntze, Rev. Gen. Pl. **1**: 44, as *Maximiliana*. 1891.

Bombax orinocense H. B. K. Nov. Gen. & Sp. **5**: 301. 1822.

Wittelsbachia orinocensis Mart. & Zucc. Nov. Gen. & Sp. **1**: 83. 1824.

Cochlospermum orinoccense (*sic*) Steud. Nom. ed. 2. **1**: 393. 1840.

Tree 16 meters high; branchlets puberulous at apex; leaves long-petioled, the leaflets 5 or rarely 6, lanceolate or oblong, acuminate, at base acute, glabrous above, puberulous along the nerves beneath, the middle one 10 to 18 cm. long, 3 to 6.5 cm. wide; axis of inflorescence thinly tomentose above, the pedicels puberulous; sepals ovate or ovate-oblong, thinly tomentose; flowers 10 to 11 cm. wide; calyx 10 to 18 mm. long; petals cuneate-obovate, excised at apex; stamens free, the anthers dehiscent by 2 terminal pores; capsule 3-locular, about 7.5 cm. long, thinly tomentose outside; seeds twisted, clothed with a long wool.

TYPE LOCALITY: Banks of the Orinoco.

The above description is compiled from the original, based on fragmentary fruiting specimens, and from the descriptions of Martius and Zuccarini and of Eichler. The native name is given as "botuto." It is recorded by Eichler from the provinces of Para (*Spruce* 483) and Alto Amazonas (*Spruce* 494).

In the National Herbarium is a single sheet of fruiting material labeled as this species, collected at Catalina on the Lower Orinoco by Rusby and Squires (no. 256). This has 5-foliolate leaves, with the sessile elliptic acuminate and apiculate perhaps not mature leaflets 10 to 11.5 cm. long or more, 3 to 4 cm. wide, glabrous above, beneath puberulous along the costa and chief veins. The capsules are obovate, slightly umbilicate at apex, 3-valved, 6 cm. long, 3 cm. thick, very densely olivaceous-puberulous and with sparse looser and longer hairs. The seeds are involute, 4 mm. wide, and clothed with a peripheral fringe of rufidulous wool about 9 mm. long. In the only other species of which I have examined the seeds, *M. vitifolia*, the much looser and denser wool is attached to the whole outer surface of the seed, on the sides as well as on the back.

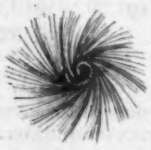

Fig. 2. Seed of *Maximilianea orinocensis*, × 1. Drawn from *Rusby & Squires* 256.

7. **Maximilianea parkeri** (Planch.) Kuntze, Rev. Gen. Pl. 1:44, as *Maximiliana*. 1891.

Cochlospermum parkeri Planch. Lond. Journ. Bot. **6:** 310. 1847.

Petioles very thinly puberulous, about 7.5 cm. long; leaflets 5, oblong, very obtuse, at base long-attenuate, glabrous, the terminal one 5 to 7.5 cm. long, 2 to 3.5 cm. wide, the two lowest less than half as large; peduncle bifurcate at apex, the flowers secund along the branches.

TYPE LOCALITY: British Guiana.

Not seen. Described from material in the Kew Herbarium, collected by Parker.

8. **Maximilianea paviaefolia** (Planch.) Kuntze, Rev. Gen. Pl. 1: 44, as *Maximiliana paviaefolia*. 1891.

Cochlospermum parviaefolium (*sic*) Planch. Lond. Journ. Bot. **6:** 311. 1847.
Cochlospermum parkiaefolium (*sic*) Hook. & Jacks. Ind. Kew 1[1]: 576. 1893.

Leaflets 5, sessile, oblong, abruptly acuminate, glabrous, the middle one 7.5 cm. long, 2.5 to 3.7 cm. wide; pedicels 1.2 cm. long or more; sepals broadly oblong, obtuse, slightly unequal, rufo-tomentellous outside; petals twice as long.

TYPE LOCALITY: Surinam.

Not seen; based on material in the Kew Herbarium, collected by Hostmann.

OCEANOGRAPHY.—*The problem of physical oceanography.*[1] A. L. THURAS. (Communicated by S. W. STRATTON, Bureau of Standards.)

Physical oceanography is that branch of oceanography which deals with the physical properties of the ocean such as temperature, salinity, density, pressure, velocity and direction of water movements, for the

[1] Received January 31, 1921.

purpose of solving the general problems of oceanic circulation. This article is written with the object of indicating the importance of this subject, especially as regards a part of the North Atlantic ocean, from the light of recent experience, and with the hope that in the near future some systematic plan of work will be undertaken to solve the important dynamical problems of the sea, thereby obtaining a more accurate knowledge of ocean circulation.

During recent years much work of an explorational nature has been carried on in the coastal waters of the United States and Canada. Dr. Henry B. Bigelow, in cooperation with the U.S. Bureau of Fisheries, has made these investigations, and the results of his work are published in the Bulletins of the Museum of Comparative Zoology, Harvard University. Several theories of the origin and circulation of our coastal waters have been corrected, and sufficient data have been collected to give a general working knowledge of the subject. Valuable observations have also been collected by observers in Canadian waters, and from these observations some exceedingly interesting theories of ocean circulation have been developed by J. W. Sandstrom. Most of this work has also been of an explorational nature.

Since the beginning of the International Ice Patrol an opportunity has been given to extend this work further out into the North Atlantic in the region of the Grand Banks of Newfoundland and in the Labrador Current and Gulf Stream. The conflict of the Labrador Current and Gulf Stream south of the Newfoundland Bank causes greater changes in the physical properties of the sea water, only a few miles apart, than occur in any other part of the world. The hydrographical conditions which exist in this locality cause much ice and fog which become a serious menace to navigation during the spring and summer months. The vessels of the U. S. Coast Guard have collected many observations while on patrol in this region. These observations have so far been chiefly of an explorational nature, as the primary purpose of the Patrol has necessarily been to locate ice and convey this information to other vessels. However, from the data obtained and the admirable current charts prepared by Captain C. E. Johnston of the Coast Guard, a fairly accurate knowledge of the movements of ice after passing Newfoundland is available.

In the spring icebergs from the shores of Greenland and Labrador are carried southward in the Labrador Current, their movement being little affected by winds, on account of their small buoyance. Those bergs which are sufficiently off shore to clear the bottom and keep in

the south-flowing branch of the Labrador Current are carried along the eastern edge of the Newfoundland Bank and southward toward the Gulf Stream. By measurements of temperature and salinity the course and extent of these streams can be determined, salinity generally being the most reliable indication. The temperature of the Labrador Current is $-1°$ to $+1°$ C., with a salinity of 33 grams of salt per 1000 grams of sea water; the Gulf Stream has a temperature of 15° to 20° C., with a salinity of 36. South of the Grand Bank, where the Labrador Current merges into the Gulf Stream, a large area of mixed water is formed, and at this place the Labrador Current ceases as an individual current. In this mixed water almost all the icebergs remain until they melt, and, as this area is usually very foggy from the mixing of the warm and cold waters, it becomes extremely dangerous for vessels. At no time during the last four years has an iceberg ever been located in the unmixed waters of the Gulf Stream, which have a salinity of 36 and a temperature above 15° C. Therefore, if vessels while passing the Newfoundland Bank would keep in this warm salt water there would be little danger from ice, and furthermore such a course would avoid most of the fog.

A comparison of the yearly observations show that the volume and strength of the Labrador Current have a decided influence on the course of the Gulf Stream in this vicinity. In some years the Gulf Stream was found almost up to the southern end of the Grand Bank, in other years as far south as the 40th degree of north latitude, a variation of over 100 miles. This variation in the deflecting power of the Labrador Current must have an effect on the volume of flow of the Gulf Stream to the eastward and also possibly west of this position. A more accurate knowledge of the volume, velocity, and location of these currents from time to time, and correlation with meteorological conditions, might yield results of great interest.

SUGGESTIONS FOR FUTURE WORK

The science of physical oceanography, having passed the period of exploration, should now be undertaken on a large scale with most carefully worked out plans of systematic investigation extending over a long period of time. This can be most effectively accomplished by: (1) international cooperation; (2) development of instruments; (3) establishment of a permanent oceanographic laboratory.

International cooperation.—The oceanographers of Europe for many years have been engaged in the study of the North Sea and surrounding waters. They have built many ingenious instruments and

developed several new methods of investigation. They have been especially interested in the waters of the Gulf Stream, on account of its effect on their climate, and would be very glad to cooperate with us in a careful study of this Stream.

Development of instruments.—In order to obtain a clearer and more complete understanding of the dynamics of ocean circulation, an effort has been made in recent years to develop recording instruments. Hans Pettersson of Göteborg, Sweden, has built a photographic recording current meter which will give a continuous record of current velocity and direction for a period of two weeks. By the use of special anchors and buoys the instrument can be firmly anchored at any depth up to several hundred meters. Dr. R. A. Daly of Harvard University has recently had constructed a thermograph which will give a continuous record of temperature for a week or more; this instrument can be used at great depths in the ocean. The U. S. Coast Guard in conjunction with the Bureau of Standards has designed and constructed a recording salinity apparatus and a recording thermometer which will give continuous records of temperature, salinity and density of the sea water taken from intake pipes below the surface by a moving vessel. As all of these instruments have been developed independently, it might be possible by cooperation and further research to develop a single instrument which would give all of these physical properties at each oceanographic station.

Oceanographic laboratory.—A physical oceanographic laboratory should be established where instruments could be tested and improved and research carried on. This laboratory should be located in Washington, preferably at the Bureau of Standards, where there are facilities for handling and developing work in scientific instruments.

SUMMARY

The physical oceanographic observations collected in our Atlantic waters indicate that that stage in development has been reached which calls for more thorough plans of work extending over a long period of time. These investigations can be accomplished most successfully by international cooperation, development of physical oceanographic instruments, and establishment of a permanent oceanographic laboratory.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. The abstracts should conform in length and general style to those appearing in this issue.

BOTANY.—*A teosinte-maize hybrid.* G. N. COLLINS and J. H. KEMPTON. Journ. Agric. Research. **19:** 1–37. Pls. 7, figs. 33. 1920.

The diminutive variety of pop corn known as Tom thumb was crossed with the teosinte of Florida (*Euchlaena mexicana* Schrad.), using teosinte as the female parent. Eleven hybrid seeds were obtained and six plants were raised to maturity. The first generation plants were intermediate between maize and teosinte. The pistillate inflorescences were all four-rowed and the staminate inflorescences resembled those of maize in that they terminated in eight-rowed central spikes.

A population of 127 second generation plants was raised from the seed of a single self-pollinated first generation plant. These plants like those of the first generation were intermediate between maize and teosinte but with greatly extended range of variation. Thirty-three of the characters that differentiated the parents were studied and with one or two exceptions no evidence of alternative or Mendelian inheritance was found.

With respect to the individual characters, the extreme variants approached or even exceeded those of the parents but none of the plants possessed any very large number of the characters of either maize or teosinte. All combinations of characters appeared that might be expected with so limited a number of individuals. There were many instances of coherences or partial couplings but there was an almost equal number of instances where characters derived from different parents showed a tendency to combine more frequently than would be expected as the result of chance. This phenomenon is termed "disherence."

While there appeared to be no imcompatible combinations, there were on the other hand no completely independent characters. A surprisingly large number of the plants combined the abundant production of suckers, characteristic of the teosinte parent, with the sturdy upright character of maize and resulted in very leafy compact plants of a type that should prove valuable for forage purposes. It remains to be seen whether the new combinations can be maintained and made to breed true. J. H. K.

BOTANY.—*Daily development of kernels of Hannchen barley from flowering to maturity.* HARRY V. HARLAN. Journ. Agric. Research **19:** 393–429. Pls. 9, figs. 17. 1920.

The growth of barley kernels is traced from flowering to maturity. By an accurate method of sampling, growth in periods as short as twelve hours has been recorded. Length, lateral diameter, dorso-ventral diameter and weight are all shown to be measurable. The length growth of barley kernels is much more rapid than had been supposed. The full length is reached by the seventh day after flowering. As soon as the length growth is checked a rapid gain in dry matter begins, accompanied by increase in the lateral and dorso-ventral diameters. The indices of growth have proved very valuable in measuring the reactions to water supply and other factors in nutrition. H. V. H.

BOTANY.—*Development of barley kernels in normal and clipped spikes and the limitations of awnless and hooded varieties.* HARRY V. HARLAN and STEPHEN ANTHONY. Journ. Agric. Research **19:** 431–472. Figs. 13. 1920.

The awns of barley are extremely harsh and are objectionable, both in handling the crop and in feeding the straw. Awnless and hooded barleys have not yielded as well as the awned sorts. The physiological value of the awn was tested by clipping the awns from a large number of spikes. Growth measurements taken by the method used in the study of the daily development of kernels of Hannchen barley showed that the awn was necessary for the maximum growth of the kernel. The kernels at maturity were not only smaller but the daily increase in weight was less on the spikes from which the awns were clipped. That this was not due to any injury of clipping was evident from the fact that the growth for the first few days after the removal of the awns was normal, the reduction in the daily increase of dry matter not taking place until the period of rapid starch infiltration had begun. The awns of Hannchen barley normally contain about 32 per cent of ash at maturity. When the awns were clipped much of this ash was apparently deposited in the rachis of the spike, causing the spikes to shatter while ripening. This may explain why the awnless and hooded varieties of barley are more prone to shatter than the awned sorts. H. V. H.

BOTANY.—*Occurrence of the fixed intermediate, Hordeum intermedium haxtoni, in crosses between H. vulgare pallidum and H. distichon palmella.* HARRY V. HARLAN and H. K. HAYES. Journ. Agric. Research **19:** 575–591. Pls. 4. 1920.

Hordeum intermedium is considered by the writers to be one of the four species of cultivated barleys. It consists of a number of varieties several of which are in field cultivation in different parts of the world. This species has been isolated by the writer from a number of crosses between 6-rowed and 2-rowed barleys. Heretofore plant breeders have considered that such crosses give only three types, the 6-rowed, 2-rowed and the heterozygous intermediate. H. V. H.

HYDROLOGY.—*Surface waters of Vermont.* C. H. PIERCE. U. S. Geol. Survey Water-Supply Paper **414.** Pp. 218, pls. 14, figs. 2. 1917.

The rivers of Vermont have figured largely in the growth and development of the State. A brief introduction sketches the changes which have taken place in the utilization of water-power since the early settlements. Fortunately, pure water is abundant, so that the higher use for domestic and municipal supply need not seriously interfere with its use for other purposes. Tables are given which show the daily, monthly, and annual run-off for the principal rivers as measured at regular gaging stations. Monthly discharge of Lake Champlain outlet (Richelieu River) for the years 1875–1916 is shown for the purpose of comparing short time records on tributary streams with the probable long term average. Precipitation records at Burlington for the same period are also given. Deficiency tables for several rivers show the number of days on which the discharge and corresponding horse-power per foot of fall were less than the amounts given in the columns for discharge and horse-power. Several maps accompany the report, a map of Vermont showing principal drainage basins and location of gaging stations, scale 1 to 1,000,000, and river surveys of Winooski River drainage basin, scale 1 to 24,000.

A gazetteer of streams is given which lists and describes the streams, lakes,

and ponds which are shown and named on topographic maps of Vermont and such other maps as are available for areas not yet covered by topographic maps. In this list are included nearly three hundred lakes and ponds and over five hundred and fifty streams. C. H. P.

PALEONTOLOGY.—*The fauna of the Cannonball marine member of the Lance formation.* TIMOTHY W. STANTON and THOMAS WAYLAND VAUGHAN. U. S. Geol. Survey Prof. Paper **128-A.** Pp. 67, pls. 10, figs. 3. 1920.

The Cannonball member is the latest marine deposit known in the Great Plains province and thus adds one more item to the record of the sea's advances and retreats which mark the diastrophic history of the region that includes the Great Plains and the Rocky Mountains. It is intimately associated with some of the continental deposits which lie near the boundary between Cretaceous and Tertiary and concerning whose exact age there has been and still is difference of opinion. It lies immediately beneath the Fort Union formation and rests on continental deposits of the Lance formation, which in turn overlie the marine Cretaceous Fox Hills sandstone. Its fauna is strictly marine and includes 2 species of Foraminifera, 6 of corals, 60 of Mollusca, and 2 of sharks.

Geographically and historically the Cannonball member is much more closely connected with the Cretaceous than with the Eocene, for the reason that it is in the midst of an area that was covered by the sea practically throughout Upper Cretaceous time, while it is a thousand miles distant from recognized marine Eocene deposits. The conclusion is therefore reached that the Cannonball marine member and consequently the whole of the Lance formation is of Cretaceous age. R. W. STONE.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

WASHINGTON ACADEMY OF SCIENCES

BOARD OF MANAGERS

The 244th meeting of the Board was held on October 25, 1920. The publication of a new edition of the "Red Book" (the directory of the ACADEMY and its affiliated societies) was authorized. At the request of Dr. GEORGE F. BOWERMAN, Librarian of the Public Library of the District of Columbia, a committee consisting of the president and resident vice-presidents was appointed to compile a list of popular books in science. The following *Committee on Meetings* for the season 1920–21 was announced: A. H. CLARK, *Chairman*, G. N. COLLINS, E. F. MUELLER, G. W. STOSE, E. T. WHERRY. Routine business was transacted at the 245th meeting on November 29, 1920. The question of increased rates for the assembly hall at the Cosmos Club for the ACADEMY and its affiliated societies was considered at the 246th meeting, December 27, 1920.

At the 247th meeting on January 24, 1921, the following committees were appointed: *Committee on Membership:* H. L. SHANTZ, *Chairman*, L. H. ADAMS, S. J. BARNETT, D. F. HEWETT, WALTER HOUGH. *Executive Committee:* The President, Corresponding Secretary, and Treasurer; F. V. COVILLE, and F. B. SILSBEE. *Editor of the Journal, 1921–1923:* SIDNEY PAIGE. The *Associate Editors* were reappointed for 1921, and G. W. STOSE was appointed to succeed Sidney Paige as representative of the Geological Society. A budget for 1921 was approved, with a slight increase for publication of the JOURNAL. It was announced by the Editors that the cost of publication of the JOURNAL would be greater in 1921 by about 70 per cent, and that on account of the limited funds available it would be necessary to decrease the number of pages, but that the amount of material would not have to be correspondingly decreased as certain economies could be effected by increasing the size of the printed page and in other ways. A request from the American Metric Association for support for certain metric system bills before Congress was declined as being contrary to the ACADEMY's policy. The following *Resident Vice-Presidents* were elected: C. HART MERRIAM, Anthropological Society; H. C. MACATEE, Medical Society.

The following persons have become members of the ACADEMY since the preceding report in the JOURNAL (August 19, 1920, p. 417):

Prof. JAMES ROWLAND ANGELL, Carnegie Corporation, 576 Fifth Ave., New York City.

Mr. HENRY WALTER BEARCE, Bureau of Standards, Washington, D. C.

Dr. CHARLES THOMAS BRUES, Bussey Institution, Forest Hills, Boston, Massachusetts.

Miss JULIA GARDNER, U. S. Geological Survey, Washington, D. C.

Dr. WILLIAM JACOB HOLLAND, Carnegie Museum, Pittsburgh, Pennsylvania.

Dr. EDWIN PECHIN HYDE, Nela Research Laboratory, National Lamp Works of the General Electric Company, Cleveland, Ohio.

Prof. VERNON KELLOGG, National Research Council, 1701 Massachusetts Avenue, Washington, D. C.

Prof. CLARENCE ERWIN MCCLUNG, National Research Council, 1701 Massachusetts Avenue, Washington, D. C.

Dr. DANIEL TREMBLY MACDOUGAL, Department of Botanical Research, Carnegie Institution of Washington, Tucson, Arizona.

Dr. WILLIAM FREDERICK MEGGERS, Bureau of Standards, Washington, D. C.

Mr. SYLVANUS GRISWOLD MORLEY, Carnegie Institution, 16th and P Streets, Washington, D. C.

Maj. Gen. GEORGE OWEN SQUIER, U. S. A., Signal Corps, War Department, Washington, D. C.

Dr. CLARK WISSLER, National Research Council, 1701 Massachusetts Avenue, Washington, D. C.

ENTOMOLOGICAL SOCIETY

329TH MEETING

The 329th meeting was held March 4, 1920, at the Cosmos Club, with President WALTON presiding and 21 members and 3 visitors present.

Program

WM. MIDDLETON: *Comparison of larval folds and adult sclerites in the saw-flies.*

This paper dealt with the structure of the immature forms of *Pteronidea ribesii*, treating especially the limits of a segment, the composition of its tergum and pleurum, and the relations existing between larval and adult parts. Particular attention was given to the transformation of the prepupa to the pupa, and it was from observations during this phase of the metamorphosis that the indications of the homologies suggested were found.

The structure of the saw-fly larval body was studied and it was concluded that the segment is composed of four folds, three of which are armed and always have a place in the exterior structure of the larva, and were shown to develop into adult sclerites, while the fourth is never armed, is concealed in some saw-flies, functioning as intersegmental skin, and was shown to be represented in the adult also as a connective membrane. The folds are defined by infoldings of the skin to which muscles are attached and the muscles as well as the arrangement of these folds throughout the whole body determine the limits of the segment. The interpretation of the segment thus arrived at applies to the thorax as well as to the abdomen and to other saw-fly larvae as was attested by several examples.

The study of the metamorphosis brought out several interesting changes in the prepupa preceding pupation, and the homologies were based on the changes exhibited by prepupae under daily observations together with some dissections of more advanced prepupae. Following a table of the homologies the paper concluded with a brief summary of the more important evidence supporting the homologies indicated and some suggestions as to the probable causes of the changes in segment limitation between larva and adult.

This paper was copiously illustrated by drawings showing the correlation of the larval and adult structures.

Discussion.—Mr. ROHWER noted that if the conclusions were correct this was another case of unusual change in the thorax of the Hymenoptera. When the first morphologist stated that the first abdominal segment became a part of the so-called thorax of the Clistogastra there was some doubt in the minds of many. This doubt was, however, easily disposed of by the presence of the spiracle on the propodeum. The borrowing of part of the metanotum of the larva by the mesonotum of the adult is not as easily proven as the transferal of the first abdominal segment to the "thorax" of the Clistogastra. When the composition of the adult mesonotum is considered, and especially when its bulk is compared with the mesonotum of the larva such a transfer does not seem unreasonable, and from the evidence furnished by saw-fly larvae and adults it seems certain that Mr. Middleton's conclusions are correct.

Notes and exhibition of specimens

MR. R. E. SNODGRASS discussed the mouthparts and the alimentary canal of the periodical cicada, on the basis of additional observations made since his paper presented at the 327th meeting of this Society. The alimentary canal of the adult cicada has an arm of the stomach forming a loop from the

rear end to its middle where it penetrates between the stomach walls (not into stomach lumen), goes forward, unites with intestine, and the latter emerges at top of stomach. The Malpighian tubules arise within the stomach walls and emerge at the constriction between the two stomach compartments.

It appears to be impossible in any way to homologise the connections of the mouth setae to the head and their internal apodemes and muscle attachments with these parts in biting insects. Yet all students of their embryological development, except one, agree that the setae are the true mandibles and maxillae. If so the details of their transformations need to be followed more closely than has yet been done.

Mr. C. T. GREENE presented a note on the larvae of the flies of the Stratomyid genus *Hermetia*. The larvae of this genus are scavengers and have been found in various places, as follows:

Hermetia chrysopila Loew, a scavenger in holes in *Opuntia* made by other insects, and in other decaying vegetable matter. *H. hunteri* Coq., habits same as *H. chrysopila*. *H. illucens* L., in wax in beehives, in latrines, and in decaying vegetable matter. Dunn reports this species breeding in large numbers in a human cadaver in the Canal Zone.

Larvae of *Hermetia sp.* were found in raw rubber at Para which was shipped to England. The larvae were presented to the U. S. National Museum by Dr. C. GORDON HEWITT of Canada.

330TH MEETING

The 330th meeting was held April 1, 1920 at the Cosmos Club, with President WALTON in the chair and 27 members and 2 visitors present.

Program

A. D. HOPKINS: *The bioclimatic law and its application to research and practice in entomology.*

The results of detailed studies of the codling moth from Maine to California and New Mexico were made available to the writer by Dr. A. L. QUAINTANCE, with a request for information on the application of the bioclimatic law to the mapping of the distribution of the codling moth and its generations, the forecasting of spraying dates, etc.

The methods utilized and the results were described and illustrated, and it was shown that forecasts could be made within the range of allowable error for any given place within the United States as to

(*a*) The dates on or near which the first, maximum, and last hatching of the eggs of the first and subsequent seasonal generations of the codling moth may be expected to occur;
(*b*) the number of generations expected;
(*c*) the optimum time to spray;
(*d*) the latitude and altitude limits of distribution of the insect;
(*e*) the altitude limit of each number of complete generations of hatched eggs.

Date constants of the egg-hatching were computed from the table of constants for each of the six stations utilized, and when these were compared with the recorded dates for all years and all events the average difference between the recorded and the constant dates was found to be within a range of error allowable for local influences, etc. Similar computations for the falling of the apple petals and the thermal meannormal for April to July, inclusive, at each of the stations gave similar results. Thus the computations from the falling of the petals and the thermal mean constants served as checks on the computations from the egg-hatching constants.

A table of altitude and latitude limit constants was prepared from which the altitude limits were computed for the several stations and when these were compared with the records they were found to closely approximate them. This served as a basis for making maps of the distribution of the generations and examples of such maps were exhibited.

It was concluded that, if the computed or forecasted dates for the hatching of the eggs of the several generations, the dates for the falling of the apple petals, the thermal means and the altitude limits for the several generations, agreed so closely with the records from six widely separated stations, similar forecasts from the same tables for any place within the United States should come close enough to the actual date or altitude limit for all practical purposes. It appears safe to assume, therefore, that with records from a few representative places in a State or the United States fairly reliable information on these and similar problems in entomology can be forecasted for any place and thus avoid a large amount of local investigation.

A. T. SPEARE: *The relation of Fungi to insects.*

It was pointed out that fungi are associated with insects in several ways. (1) An association in which insects prey upon fungi. (2) The commensalistic association. (3) The symbiotic relationship. (4) An association in which fungi are parasites upon insects. Examples of the first three types were briefly considered. Examples of the fourth type of fungi that live as parasites upon insects were considered in some detail, particularly with reference to the pathogenic forms. Lantern slides showing many rare exotic entomogenous fungi were shown.

331ST MEETING

The 331st meeting was held on May 6, 1920, at the Cosmos Club, with President WALTON in the chair and 34 members and 8 visitors present. Dr. FRANZ SCHRADER was elected to membership.

Program

J. M. ALDRICH: *Bot flies and their biology.*

Dr. ALDRICH summarized what is known of the host relations both as to the species of the host, the oviposition habits and methods of ingress into the body of the host, and the subsequent development of the immature stages.

J. J. DAVIS: *The Japanese beetle and operations under way for its control.* This was a statement concerning the work under way at Riverton, N. J., looking to the control of this introduced pest. Many photographs of control operations were exhibited.

Dr. F. KÖLPIN RAVN, Professor of Plant Pathology in the Royal College of Agriculture at Copenhagen, Denmark, was invited by the President to address the Society. Dr. Ravn spoke on the desirability of cooperation between entomologists and plant pathologists. He brought out the close relationship between insects and the organisms causing diseases of plants, citing some very striking examples of the interdependence between the two factors. He expressed the opinion that the well-trained plant pathologist should have a good knowledge of zoology, systematic botany (including mycology and bacteriology), as well as plant physiology, while specializing in one subject or another. This he thought necessary to enable the pathologist to determine at once all of the more common diseases and injuries and to give advice as to remedial measures.

332ND MEETING

The 332nd meeting was held at the Cosmos Club, June 4, 1920, with Vice-President A. B. GAHAN in the chair and 22 members and 5 visitors present.

Corresponding Secretary-Treasurer S. A. ROHWER reported on the final settlement of the will of the late FREDERICK KNAB, under the terms of which the Society was the residuary legatee. By this the Society adds some $1400 to its publication fund. Mr. ROHWER also read a letter from two members of the Zoologische und Botanische Gesellschaft of Vienna, explaining the difficulty they were having in securing food and offering to exchange portions of their valuable collection of cavern insects for food parcels. After some discussion the Society authorized the Treasurer to solicit subscriptions, leaving the selection of the insects in the exchange to the owners.

Dr. ADAM BÖVING announced the death from blood-poisoning of Dr. F. KÖLPIN RAVN of Copenhagen at East Orange, N. J., on May 25th.

Notes and exhibition of specimens

Under the title of *The introduction of a serious pest*, Mr. J. A. HYSLOP announced the finding of the injurious wire worm, *Agriotes lineatus* L., in the United States. A large shipment of potatoes from Copenhagen, consigned to New York City, was inspected by Port Inspector D. G. TOWER on February 2, 1920, and a wire worm was found in one of the tubers. For other reasons than the insect pest, these potatoes were confined to local consumption so the danger of this insect being established by this shipment is very slight. *Agriotes lineatus* is probably one of the most troublesome pests to field grown crops in Europe, especially sugar beets, potatoes, carrots, and all the small grains. It is distributed throughout northern Europe and the British Isles, and it seems remarkable that it has not become established in this country through the large importations of potatoes which we annually receive from Europe.

Mr. E. A. SCHWARZ stated that he had recently received alive what was probably the larva of this species in soil around rose bushes from Europe.

Mr. ROHWER presented a note by WILLIAM H. FOX, a former member, recording the occurrence of the spider *Lathrodectes mactans* Fabr. in northern New Hampshire. Dr. Fox's note is as follows:

"In July, 1918, I was sitting reading on the upper porch of my cottage at Twin Lakes (Little Sunapee), New Hampshire, when I noticed, just outside the wire screening which protected all the opening of the porch, a female *Lathrodectes mactans*, very busily making a web. I moved up until I was less than 18 inches from the spider and watched her for some time at her work. The web was very irregular, of many crossed threads, but not at all thick. In size I should judge it to be roughly, 4 ft. by 5 or 6 ft. Unfortunately, the porches were so well screened it was impossible to procure the spider, but as I watched her for some fifteen minutes at close range there could be no mistake in the identification. The web remained *in situ* for some time, but although I watched a good many times, I failed to again see the spider. This is the only adult *L. mactans* that I have ever seen in New Hampshire, but I have procured the young from the mud nests of a species of *Sphex*, in southern New Hampshire (Hollis)."

Mr. C. H. RICHARDSON reviewed two recently published papers by Dr. AUGUST KROGH of the University of Copenhagen on the physiology of respiration in insects (*Pflügers Arch. Gedamte Physiol.* 95–112, 179. 1920), which are of interest to students of insect physiology and to those engaged in studies on gaseous insecticides. The conclusions reached by this author are: that gas diffusion is often the only method by which the tracheal air of insects is renewed; that in some forms such as very active adult insects or those having

large tracheal trunks, air sacks, etc., mechanical ventilation, accomplished by body movements, supplements gas diffusion. But even in these forms gas exchange in the finer tracheal branches must be accomplished by diffusion. The *Dytiscus* larva is a type which shows both mechanical ventilation and gas diffusion.

Mr. E. R. SASSCER discussed Mr. RICHARDSON's note in its relation to disinfection with poisonous gases. In reply to questions he stated there is 30% more gas in sodium cyanide than in potassium cyanide, and that dormant insects are more resistant to gas poisoning than active insects.

Mr. WM. MIDDLETON presented *Some notes on the terminal abdominal appendages of saw-flies*, taken from a paper bearing the above title, which will be published elsewhere.

Mr. H. K. PLANK exhibited adult specimens of a new pest of the cranberry, the cranberry root weevil, *Geoderces incomptus* Horn, from near Cranberry Station, Washington, and showed photographs from life of the eggs, larvae, pupa, and adult, also of the female in the act of ovipositing in folds of a "buck brush" leaf, *Spiraea douglasii*, a common bog plant. He described briefly the work o the larvae and adults, showing photographs of larvae feeding on the small roots of the cranberry just beneath the surface of the bog, the destructiveness of the larvae, and the adults in the act of feeding on the terminal leaves of the cranberry upright.

Mr. PLANK also exhibited specimens from Seaview, Washington, of a species of *Spicaria*, a new fungous disease of the pupae of the blackhead fireworm, *Rhopobota naevana* Hn. The identification of this insect was made by CARL HEINRICH of the U. S. National Museum. It is the same species that occurs on the bogs of the east and in Europe, of which *vacciniana* Pack. is a synonym. This fungous disease attacks the pupa in its loosely constructed cocoon in the trash and leaves beneath the vines and becomes apparent about early or mid August.

Mr. PLANK called attention to the single generation of *Rhopobota naevana* Hn. on one bog near Cranberry Station, Washington, as compared with two and three generations of the same species on other bogs in the same general locality. The range of the daily temperature on the former is somewhat greater, and this bog is also somewhat more wind-swept than the bogs on which two and three generations exist. Specimens of adults were exhibited.

Mr. L. O. JACKSON told of an encounter observed by his mother between a bumble bee and a white-faced hornet (*Vespa maculata*), in which the bumble bee came off victorious.

A note on *Hymenoptera at the British Museum* by T. D. A. COCKERELL was read by Mr. ROHWER, as follows:

"When I visited the British Museum about 15 years ago, I found Col. BINGHAM arranging the ants, but the bees had never been rearranged since the death of F. SMITH about 26 years before. The progress made since 1905 is remarkable, and it will be of interest to quote a summary from a recent (Nov. 26, 1919) letter received from Mr. ROWLAND E. TURNER:

" 'MEADE-WALDO had practically finished the bees before his death, including the incorporation of the Biologia material except the *Prosopis* group. They now occupy 12 cabinets; Diplotera 4, Sphegidae 7, Psammocharidae 6, Mutillidae, Thynnidae, and Scoliidae 6; so that Aculeates are pretty well incorporated up to date excepting ants and Mutillidae. I have recently got the

Braconidae into someth ng like order; also the Evaniidae, etc., and DODD has arranged our exotic Proctotrupidae. MORLEY has done portions of the Ichneumonidae, and MORICE has nearly completed the saw-flies. The exotic Hymenoptera altogether occupy 70 cabinets now, which is a great change since I first came here in 1905. But the collection is still a very small one compared to what it ought to be, as from many regions we have no recent material.'

"The death of Mr. MEADE-WALDO was a very severe blow to the Museum and to hymenopterology. The most important accessions to the collection of Hymenoptera are doubtless the collections obtained by Mr. TURNER in Australia, which are extremely rich in new and nteresting species. Mr. TURNER is now off to South Africa, where he is sure to make large and important collections."

In discussing this note Mr. ROHWER spoke of the *Hymenoptera at the National Museum*, as follows: "While it is undesirable, as well as unprofitable, to make comparisons, I feel that the following remarks may be of some interest at this time because of the short note by Prof. COCKERELL.

"Four years before the Division of Insects of the National Museum was formally started, and coincident with the time when Riley deposited his collection in the old building of the National Museum, W. F. KIRBY edited his first volume of the Hymenoptera of the British Museum. This volume dealt only with the saw-flies. Thirty years prior to that FREDERICK SMITH had catalogued and described the Aculeate Hymenoptera of the British Museum and had published his results in five volumes, extending from 1854 to 1857, as a catalogue of the hymenopterous insects.

"The British Museum has developed naturally along the lines of a museum. Their hymenopterous collections have been accumulated by collectors and students of habits and, of course, they have amassed great quantities of material, wasps, bees, and other Aculeates. The National Museum collection on the other hand was developed because of and to support agriculture. Its greatest advances have been made in parasitic groups, so where the British Museum is weakest, the National Museum is strongest, and I think we can say with assurance that the collection of parasitic hymenoptera in the National Museum is excelled by none. It formed the basis of all of Ashmead's monographs, and there is no institution whose collection of Chalcids can compare in any way with that which has been amassed by agricultural entomologists in the United States.

"The collection of Hymenoptera n the National Museum is not arranged in as good order as we might wish because there are many more undetermined specimens than there are determined specimens. About a year ago we made a rather careful inventory of the adults and found that the collection contained 17,638 species, of which 8,566 were represented by types. There are 131,906 determined specimens, and of the undetermined, 361,851. The total number of spec mens in the Museum was approximately a half million when we made our inventory a year ago. One feature which our collection has which, I believe, is not developed to any degree in any other institution, is the alcoholic collection of immature stages. We workers here feel sure that there is much to be desired and there are many gaps which need filling, but if we visit other institutions and see how little they have, we are forced to realize that the alcoholic collection of immature stages is by far the best available to students. This is especially true of the immature stages of the saw-flies.

"Because of the incomplete arrangement of the collection, it is impossible to definitely state the number of cases the arranged collection would occupy. To give some idea I think we can justly give the number of cases which are allotted to the various groups. The allotment of room does not allow for any expansion and is an estimate which covers only the actual amount of space needed to arrange the collection already in hand. Our unit is a double-columned steel case containing 50 drawers approximately 18 inches square. The saw-flies occupy three cases and they are fairly well arranged. The Vespoids have two cases allotted to them; the Mutilloids three-and-a-half cases; the Sphecoids three cases; the Ants four cases; the Bees five cases; the Braconids three cases; the Ichneumonids five; Cynipoids each two; and the Chalcids five."

Mr. E. A. SCHWARZ spoke of the Tenebrionid genus *Epitragus*, the species of which are commonly found on living plants, where they feed on scale insects. Mr. BARBER had dissected a specimen of a Florida species, taken on orange, and found scale insects in its crop.

Mr. H. L. SANFORD announced that Brood 19 (13-year race) of the periodical cicada had made its appearance in Alabama, Missouri, North Carolina, Tennessee, Oklahoma, and possibly Texas. Mr. E. A. SCHWARZ stated that the recording of this cicada west of the Mississippi is due to erroneous determination, and that there is in Texas a related species that occurs at the same time as the 13-year brood.

Mr. R. A. CUSHMAN presented a note on *An external egg-parasite* as follows:

The eggs of many insects are subject to the attack of parasites, but so far as I am aware all such parasites recorded live within the host egg. Certain Ichneumonids of the genera *Tromatobia*, *Gelis*, and *Hemiteles* live as larvae in the egg-sacs of spiders feeding on the eggs or young spiders. But I believe that no case has been recorded in which a parasite larva reached full growth as an external parasite of a single insect egg. On one occasion I found among a number of eggs of the saw-fly, *Cimbex americana* Leach, several that were being fed upon by hymenopterous larvae, some of which later developed into Chalcids of the genus *Sympiesis*. Whether this is the normal habit of this particular species I do not know. Many of the species of *Sympiesis* are parasitic on the larvae of leaf-miners, and the *Cimbex* egg, being placed just under the epidermis of the leaf, may have attracted a parasite normally attacking a leaf-miner.

Mr. H. S. BARBER exhibited specimens of soft-bodied insects and soft parts of insects that he had prepared in such a way as to retain the natural form in the dry state.

Mr. A. B. GAHAN spoke of the difficulty of distinguishing species in the chalcid genus *Anastatus* and of the hosts of the various species.

Mr. S. A. ROHWER told of a carpenter bee that he had observed working at all hours except 5 to 6 a.m., and stated that Aculeate Hymenoptera do not ordinarily work at night. Mr. BARBER stated that he had known yellow jackets to stay away from the nest all night.

R. A. CUSHMAN, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

The Pick and Hammer Club met at the Geological Survey on February 26. President W. W. ATWOOD of Clark University spoke on *The Quaternary geology and the physiography of the San Juan region of Colorado.*

The interchange of publications between Germany and the United States, which was suspended when this country entered the World War in 1917, has been resumed by the International Exchange Service of the Smithsonian Institution.

The Division of Insects of the National Museum has recently acquired specimens of a minute subterranean Arthropod, belonging to the class *Myrientomata*. This class, which differs from insects in having no antennae, was hitherto represented in the collection only by four specimens of an Italian species. The new local specimens were taken by Messrs. BARBER and MANN, along the Potomac. It is probable that species of this group are not rare, but because of their minute size and subterranean habit are usually overlooked by the collector.

The Petrologists' Club met on February 15, and discussed papers by M. I. GOLDMAN on *Early stages of metamorphism in sedimentary rocks*, and D. F. HEWETT on *Bentonite*.

Dr. CHARLES H. HERTY, editor of the *Journal of Industrial and Engineering Chemistry* and chairman of the committee to cooperate with the Chemical Warfare Service, gave a lecture on *The Reserves of the Chemical Warfare Service* at the National Museum, at 8 p.m., Monday, February 21. The lecture was given under the auspices of the National Research Council, and was accompanied by a popular exhibit emphasizing the importance of fundamental research in chemistry and its relation to national defense, medicine and industry. This exhibit was later opened to the public at the offices of the Council, 1701 Massachusetts Avenue.

Mr. L. W. WALLACE has been appointed executive secretary of the American Engineering Council, the executive body of the Federated American Engineering Societies.

The second annual convention of the Federal Department of the American Association of Engineers was held at the New Ebbitt Hotel, February 28 to March 2.

The Division of Insects of the United States National Museum has recently received an interesting collection of subterranean and cave-inhabiting Coleoptera, which contains 244 specimens, representing 100 species, all of which are new to the National Collection. This accession came from two Austrian entomologists who have made a specialty of those obscure and unusual beetles so abundant in the caves of Europe. Last year these two gentlemen, Professor OTTO SCHEERPELTZ and Professor EMIL MOCZARSKI, addressed a letter to the Entomological Society of Washington, in which they offered to sell their valuable collection for food drafts. By means of a private subscription taken among the various members of the Society, a sufficient sum was realized with which to purchase a number of food drafts, and at the time of mailing these, Professor Scheerpeltz and Professor Moczarski were informed that the Society would be glad to accept for the collection of our National Museum specimens from their duplicates. The splendid sending mentioned above is the result, and has been accessioned as a gift from these distinguished Viennese entomologists. (S. A. R.)

Major J. W. BAGLEY of the Corps of Engineers, U. S. Army, who was formerly with the U. S. Geological Survey, has been assigned to duty at the Air Service Engineering Field at Dayton, Ohio, as representative of the Engineers in experimental work connected with the adaptation of aerial photography to mapping.

Mr. EDWARD CHESTER BARNARD, member of the International (Canadian) Boundary Commissions, died on February 6, 1921, in his fifty-eighth year. Mr. Barnard was born in New York City, November 13, 1863. After graduation from the Columbia Univers ty School of Mines in 1884 he joined the U. S. Geological Survey, and as topographer and, later, geographer with the Survey until 1915 took part in the mapping of Alaska and many of the western States. In 1915 he was appointed commissioner for the United States in the International (Canadian) Boundary Commissions, with which he had been chief topographer since 1903, engaged in the resurvey of the boundary line along the 49th parallel. He was a member of the ACADEMY and the Geological Society, and was president of the Washington Society of Engineers in 1920.

Mr. FREDERIC PERKINS DEWEY, Assayer of the Bureau of the Mint, U. S. Treasury Department, died on February 10, 1921, in his sixty-sixth year. Mr. Dewey was born at Hartford, Connecticut, October 4, 1855. After graduation from Yale University he became instructor in chemistry at Lafayette College. From 1881 to 1889 he was connected with the U. S. Government, first as chemist with the Tenth Census, then as mineralogist with the Geological Survey, then as curator in the National Museum. After 24 years in chemical and metallurgical patent practice he became assayer of the Mint in 1903. He was a member of the ACADEMY, and was one of the founders of the Chemical Society of Washington, of which he was president in 1893.

Mr. R. N. HARGER, assistant biochemist at the Bureau of Plant Industry, U. S. Department of Agriculture, resigned in September to accept a National Research Council fellowship in chemistry. The research is in organic chemistry, and is being carried on at Yale University.

Mr. HERBERT C. HOOVER of California has been elected a trustee of the Carnegie Institution of Washington.

Mr. J. A. JEANCON has resigned his position as temporary ethnologist in the Bureau of American Ethnology and has accepted a position in Denver as head curator of the Colorado State Museum.

A farewell reception and buffet supper in honor of Secretary of Agriculture EDWIN T. MEREDITH was held at the Raleigh on February 16 and was attended by about 600 members of the scientific and technical staff. The committee in charge consisted of CHARLES E. CHAMBLISS and R. G. PIERCE, representing the Botanical Society of Washington; F. R. QUACKENBUSH, the American Association of Engineers; J. KITTREDGE, JR., the Society of Foresters; and V. K. CHESNUT, the Chemical Society of Washington.

Dr. L. A. MIKESKA has resigned from the Color Laboratory of the Bureau of Chemistry, U. S. Department of Agriculture, to join the staff of the Rockefeller Institute for Medical Research, New York City.

Mr. THOMAS M. RECTOR, formerly in charge of the division of food technology in the Institute of Industrial Research, has been appointed director of the department of industrial chemistry of the Pease Laboratories, Inc., of New York City.

X